

WHAT IS CLAIMED IS:

1. A method of preparing a three-dimensional sintered product which comprises steps of (a) sintering a predetermined portion of a first powder material layer by irradiation of an first optical beam to form a first layer having a higher density, (b) forming a second powder material layer on the first layer and (c) sintering a predetermined portion of the second powder material layer by irradiation of a second optical beam to form a second layer having a lower density and bond the second lower density layer to the first higher density layer and (d) repeating the steps (a) to (c) to form a three-dimensional sintered block comprising a plurality of the first and second layers,

wherein, when the second lower density layer is formed on the first higher density layer, a) after the first higher density layer is formed larger in thickness than a predetermined value and shaved off to a predetermined thickness, b) after an additional intermediate layer having a density equal to or lower than that of the first higher density layer, is formed on the higher density layer which is sintered smaller in thickness than a predetermined value or c) directly on the higher density, a powder material layer for the lower density layer is formed at a predetermined thickness so as to have a thickness suitable for sintering condition and then the powder material layer is sintered to form the lower density layer.

2. A method of preparing a three-dimensional sintered product according to claim 1, wherein the additional intermediate layer is a middle density sintered layer and comprising a plurality of layers which density decreases from that of the higher density to that of the lower density according to the layer position.

3. A method of preparing a three-dimensional sintered product according to claim 1, wherein a sintering condition for the intermediate layer is determined according to a thickness of the powder material layer.

4. A method of preparing a three-dimensional sintered product according to claim 1, wherein a powder material layer having a thickness smaller than a predetermined value is formed on the top layer among the higher density layers and sintered at a sintering condition for the lower density layer to form a lower density layer.
5. A method of preparing a three-dimensional sintered product according to claim 1, wherein a powder material layer having a thickness smaller than a predetermined value is formed on the top layer among the higher density layers and sintered at a sintering condition for the higher density layer to form a higher density layer, and then a lower density layer is formed on the higher density layer.
6. A method of preparing a three-dimensional sintered product according to claim 1, wherein when a powder material layer having a thickness smaller than a predetermined value is formed on the top layer of the higher density layers and the thickness of the powder material layer is determined by a sinking amount of the stage where the powder material layer is formed, an additional powder material layer is formed without no sinking of the stage.
7. A method of preparing a three-dimensional sintered product according to claim 1, wherein when the second lower density layer is formed on the first higher density layer, the position of the higher density layer is measured and according to the measuring result, a thickness and a sintering condition of next powder material layer is determined.
8. A method of preparing a three-dimensional sintered product according to claim 1, wherein when the second lower density layer is formed on the first higher density layer, a driving load of blade for leveling the powder material layer is measured and according to the measuring result, a thickness and a sintering condition of next powder material layer is determined.

9. A method of preparing a three-dimensional sintered product according to claim 1, wherein the three-dimensional sintered product is a metal mold and is made of powder material having a average powder size of 0.1 to 200 micron and comprising ferrous powder and one or more of nonferrous metal powders
- 5 consisting of nickel, nickel alloy, copper, and copper alloy.
10. A method of preparing a three-dimensional sintered product according to claim 2, wherein a sintering condition for the intermediate layer is determined according to a thickness of the powder material layer.

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